



#6

SEQUENCE LISTING

<110> Scott, Fred W.

<120> Recombinant Multivalent Viral Vaccine

<130> 18617.0016

<140> US 09/873,881

<141> 2001-06-04

<150> US 08/552,369

<151> 1995-11-03

<160> 19

<210> 1

<211> 2254

<212> DNA

<213> feline panleukopenia virus

<220>

<223>

<400> 1

| | | | | | | | | | | | | | | | |
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| atg | agt | gat | gga | gca | gtt | caa | cca | gac | ggt | ggt | caa | cct | gct | gtc | 45 |
| Met | Ser | Asp | Gly | Ala | Val | Gln | Pro | Asp | Gly | Gly | Gln | Pro | Ala | Val | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| aga | aat | gaa | aga | gct | aca | gga | tct | ggg | aac | ggg | tct | gga | ggc | ggg | 90 |
| Arg | Asn | Glu | Arg | Ala | Thr | Gly | Ser | Gly | Asn | Gly | Ser | Gly | Gly | Gly | |
| | | | | 20 | | | | | 25 | | | | | 30 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ggt | ggt | ggt | ggt | tct | ggg | ggt | gtg | ggg | att | tct | acg | ggt | act | ttc | 135 |
| Gly | Gly | Gly | Gly | Ser | Gly | Gly | Val | Gly | Ile | Ser | Thr | Gly | Thr | Phe | |
| | | | | 35 | | | | | 40 | | | | | 45 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| aat | aat | cag | acg | gaa | ttt | aaa | ttt | ttg | gaa | aac | gga | tgg | gtg | gaa | 180 |
| Asn | Asn | Gln | Thr | Glu | Phe | Lys | Phe | Leu | Glu | Asn | Gly | Trp | Val | Glu | |
| | | | | 50 | | | | | 55 | | | | | 60 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| atc | aca | gca | aac | tca | agc | aga | ctt | gta | cat | tta | aat | atg | cca | gaa | 225 |
| Ile | Thr | Ala | Asn | Ser | Ser | Arg | Leu | Val | His | Leu | Asn | Met | Pro | Glu | |
| | | | | 65 | | | | | 70 | | | | | 75 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| agt | gaa | aat | tat | aaa | aga | gta | gtt | gta | aat | aat | atg | gat | aaa | act | 270 |
| Ser | Glu | Asn | Tyr | Lys | Arg | Val | Val | Val | Asn | Asn | Met | Asp | Lys | Thr | |
| | | | | 80 | | | | | 85 | | | | | 90 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gca | gtt | aaa | gga | aac | atg | gct | tta | gat | gac | act | cat | gta | caa | att | 315 |
| Ala | Val | Lys | Gly | Asn | Met | Ala | Leu | Asp | Asp | Thr | His | Val | Gln | Ile | |

| 95 | | | | | | | | | | 100 | | | | | 105 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|--|
| gta | aca | cct | tgg | tca | ttg | gtt | gat | gca | aat | gct | tgg | gga | gtt | tgg | 360 | | | | | |
| Val | Thr | Pro | Trp | Ser | Leu | Val | Asp | Ala | Asn | Ala | Trp | Gly | Val | Trp | | | | | | |
| | | | | 110 | | | | | 115 | | | | | 120 | | | | | | |
| ttt | aat | cca | gga | gat | tgg | caa | cta | att | gtt | aat | act | atg | agt | gag | 405 | | | | | |
| Phe | Asn | Pro | Gly | Asp | Trp | Gln | Leu | Ile | Val | Asn | Thr | Met | Ser | Glu | | | | | | |
| | | | | 125 | | | | | 130 | | | | | 135 | | | | | | |
| ttg | cat | tta | gtt | agt | ttt | gaa | caa | gaa | att | ttt | aat | gtt | gtt | tta | 450 | | | | | |
| Leu | His | Leu | Val | Ser | Phe | Glu | Gln | Glu | Ile | Phe | Asn | Val | Val | Leu | | | | | | |
| | | | | 140 | | | | | 145 | | | | | 150 | | | | | | |
| aag | act | gtt | tca | gaa | tct | gct | act | cag | cca | cca | act | aaa | gtt | tat | 495 | | | | | |
| Lys | Thr | Val | Ser | Glu | Ser | Ala | Thr | Gln | Pro | Pro | Thr | Lys | Val | Tyr | | | | | | |
| | | | | 155 | | | | | 160 | | | | | 165 | | | | | | |
| aat | aat | gat | tta | act | gca | tca | ttg | atg | gtt | gca | tta | gat | agt | aat | 540 | | | | | |
| Asn | Asn | Asp | Leu | Thr | Ala | Ser | Leu | Met | Val | Ala | Leu | Asp | Ser | Asn | | | | | | |
| | | | | 170 | | | | | 175 | | | | | 180 | | | | | | |
| aat | act | atg | cca | ttt | act | cca | gca | gct | atg | aga | tct | gag | aca | ttg | 585 | | | | | |
| Asn | Thr | Met | Pro | Phe | Thr | Pro | Ala | Ala | Met | Arg | Ser | Glu | Thr | Leu | | | | | | |
| | | | | 185 | | | | | 190 | | | | | 195 | | | | | | |
| ggt | ttt | tat | cca | tgg | aaa | cca | acc | ata | cca | act | cca | tgg | aga | tat | 630 | | | | | |
| Gly | Phe | Tyr | Pro | Trp | Lys | Pro | Thr | Ile | Pro | Thr | Pro | Trp | Arg | Tyr | | | | | | |
| | | | | 200 | | | | | 205 | | | | | 210 | | | | | | |
| tat | ttt | caa | tgg | gat | aga | aca | tta | ata | cca | tct | cat | act | gga | act | 675 | | | | | |
| Tyr | Phe | Gln | Trp | Asp | Arg | Thr | Leu | Ile | Pro | Ser | His | Thr | Gly | Thr | | | | | | |
| | | | | 215 | | | | | 220 | | | | | 225 | | | | | | |
| agt | ggc | aca | cca | aca | aat | ata | tat | cat | ggt | aca | gat | cca | gat | gat | 720 | | | | | |
| Ser | Gly | Thr | Pro | Thr | Asn | Ile | Tyr | His | Gly | Thr | Asp | Pro | Asp | Asp | | | | | | |
| | | | | 230 | | | | | 235 | | | | | 240 | | | | | | |
| gtt | caa | ttt | tat | act | att | gaa | aat | tct | gtg | cca | gta | cac | tta | cta | 765 | | | | | |
| Val | Gln | Phe | Tyr | Thr | Ile | Glu | Asn | Ser | Val | Pro | Val | His | Leu | Leu | | | | | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | | | | | |
| aga | aca | ggt | gat | gaa | ttt | gct | aca | gga | aca | ttt | ttt | ttt | gat | tgt | 810 | | | | | |
| Arg | Thr | Gly | Asp | Glu | Phe | Ala | Thr | Gly | Thr | Phe | Phe | Phe | Asp | Cys | | | | | | |
| | | | | 260 | | | | | 265 | | | | | 270 | | | | | | |
| aaa | cca | tgt | aga | cta | aca | cat | aca | tgg | caa | aca | aac | aga | gca | ttg | 855 | | | | | |
| Lys | Pro | Cys | Arg | Leu | Thr | His | Thr | Trp | Gln | Thr | Asn | Arg | Ala | Leu | | | | | | |
| | | | | 275 | | | | | 280 | | | | | 285 | | | | | | |
| ggc | tta | cca | cca | ttt | cta | aat | tct | ttg | cct | caa | tct | gaa | gga | gct | 900 | | | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Gly | Leu | Pro | Pro | Phe | Leu | Asn | Ser | Leu | Pro | Gln | Ser | Glu | Gly | Ala | | |
| | | | | 290 | | | | | 295 | | | | | 300 | | |
| act | aac | ttt | ggt | gat | ata | gga | ggt | caa | caa | gat | aaa | aga | cgt | ggt | 945 | |
| Thr | Asn | Phe | Gly | Asp | Ile | Gly | Val | Gln | Gln | Asp | Lys | Arg | Arg | Gly | | |
| | | | | 305 | | | | | 310 | | | | | 315 | | |
| gta | act | caa | atg | gga | aat | aca | gac | tat | att | act | gaa | gct | act | att | 990 | |
| Val | Thr | Gln | Met | Gly | Asn | Thr | Asp | Tyr | Ile | Thr | Glu | Ala | Thr | Ile | | |
| | | | | 320 | | | | | 325 | | | | | 330 | | |
| atg | aga | cca | gct | gag | gtt | ggt | tat | agt | gca | cca | tat | tat | tct | ttt | 1035 | |
| Met | Arg | Pro | Ala | Glu | Val | Gly | Tyr | Ser | Ala | Pro | Tyr | Tyr | Ser | Phe | | |
| | | | | 335 | | | | | 340 | | | | | 345 | | |
| gaa | gcg | tct | aca | caa | ggg | cca | ttt | aaa | ata | cct | att | gca | gca | gga | 1080 | |
| Glu | Ala | Ser | Thr | Gln | Gly | Pro | Phe | Lys | Ile | Pro | Ile | Ala | Ala | Gly | | |
| | | | | 350 | | | | | 355 | | | | | 360 | | |
| cgg | ggg | gga | gcg | caa | aca | gat | gaa | aat | caa | gca | gca | gat | ggt | gat | 1125 | |
| Arg | Gly | Gly | Ala | Gln | Thr | Asp | Glu | Asn | Gln | Ala | Ala | Asp | Gly | Asp | | |
| | | | | 365 | | | | | 370 | | | | | 375 | | |
| cca | aga | tat | gca | ttt | ggt | aga | caa | cat | ggt | caa | aaa | act | act | aca | 1170 | |
| Pro | Arg | Tyr | Ala | Phe | Gly | Arg | Gln | His | Gly | Gln | Lys | Thr | Thr | Thr | | |
| | | | | 380 | | | | | 385 | | | | | 390 | | |
| aca | gga | gaa | aca | cct | gag | aga | ttt | aca | tat | ata | gca | cat | caa | gat | 1215 | |
| Thr | Gly | Glu | Thr | Pro | Glu | Arg | Phe | Thr | Tyr | Ile | Ala | His | Gln | Asp | | |
| | | | | 395 | | | | | 400 | | | | | 405 | | |
| aca | gga | aga | tat | cca | gca | gga | gat | tgg | att | caa | aat | att | aac | ttt | 1260 | |
| Thr | Gly | Arg | Tyr | Pro | Ala | Gly | Asp | Trp | Ile | Gln | Asn | Ile | Asn | Phe | | |
| | | | | 410 | | | | | 415 | | | | | 420 | | |
| aac | ctt | cct | gta | aca | aat | gat | aat | gta | tgt | cta | cca | aca | gat | cca | 1305 | |
| Asn | Leu | Pro | Val | Thr | Asn | Asp | Asn | Val | Leu | Leu | Pro | Thr | Asp | Pro | | |
| | | | | 425 | | | | | 430 | | | | | 435 | | |
| att | gga | ggt | aaa | aca | gga | atc | aac | tat | act | aat | ata | ttt | aat | act | 1350 | |
| Ile | Gly | Gly | Lys | Thr | Gly | Ile | Asn | Tyr | Thr | Asn | Ile | Phe | Asn | Thr | | |
| | | | | 440 | | | | | 445 | | | | | 450 | | |
| tat | ggt | cct | tta | act | gca | tta | aat | aat | gta | cca | cca | ggt | tat | cca | 1395 | |
| Tyr | Gly | Pro | Leu | Thr | Ala | Leu | Asn | Asn | Val | Pro | Pro | Val | Tyr | Pro | | |
| | | | | 455 | | | | | 460 | | | | | 465 | | |
| aat | ggt | caa | att | tgg | gat | aaa | gaa | ttt | gat | act | gac | tta | aaa | cca | 1440 | |
| Asn | Gly | Gln | Ile | Trp | Asp | Lys | Glu | Phe | Asp | Thr | Asp | Leu | Lys | Pro | | |
| | | | | 470 | | | | | 475 | | | | | 480 | | |

| | |
|---|------|
| aga ctt cat gta aat gca cca ttt gtt tgt caa aat aat tgt cct | 1485 |
| Arg Leu His Val Asn Ala Pro Phe Val Cys Gln Asn Asn Cys Pro | |
| 485 490 495 | |
| ggt caa tta ttt gta aaa gtt gcg cct aat tta aca aat gaa tat | 1530 |
| Gly Gln Leu Phe Val Lys Val Ala Pro Asn Leu Thr Asn Glu Tyr | |
| 500 505 510 | |
| gat cct gat gca tct gct aat atg tca aga att gta act tac tca | 1575 |
| Asp Pro Asp Ala Ser Ala Asn Met Ser Arg Ile Val Thr Tyr Ser | |
| 515 520 525 | |
| gat ttt tgg tgg aaa ggt aaa tta gta ttt aaa gct aaa cta aga | 1620 |
| Asp Phe Trp Trp Lys Gly Lys Leu Val Phe Lys Ala Lys Leu Arg | |
| 530 535 540 | |
| gca tct cat act tgg aat cca att caa caa atg agt att aat gta | 1665 |
| Ala Ser His Thr Trp Asn Pro Ile Gln Gln Met Ser Ile Asn Val | |
| 545 550 555 | |
| gat aac caa ttt aac tat cta cca aat aat att gga gct atg aaa | 1710 |
| Asp Asn Gln Phe Asn Tyr Leu Pro Asn Asn Ile Gly Ala Met Lys | |
| 560 565 570 | |
| att gta tat gaa aaa tct caa cta gca cct aga aaa tta tat | 1752 |
| Ile Val Tyr Glu Lys Ser Gln Leu Ala Pro Arg Lys Leu Tyr | |
| 575 580 | |
| taatatactt actatgtttt tatgggttatt acatatcaac tagcacctag | 1802 |
| aaaatttatat taatatactt actatgtttt tatgttttatt acatattatt | 1852 |
| ttaagattaa ttaaattaca acatagaaat attgtacttg tatttgatat | 1902 |
| aggatttaga aggtttgtta tatggtatac aataactgta agaaatagaa | 1952 |
| gaacatttag atcatgggtta gtatggtata caataactgt aagaaataga | 2002 |
| agaacattta gatcatgggtt agtagtttgt tttataaaat gtaattgtaa | 2052 |
| actattaatg tatgttggtta tgggtgtgggt gggttggttg tttgccctta | 2102 |
| gaatatgtta aggaccaaaa aaatcaataa aagacattta aaacttaatg | 2152 |
| gtctcgtata ctgtctataa ggtgaactaa ccttaccata agtatcaact | 2202 |
| tgtctttaag ggggggggtgg gtgggagatg cacaatatca gtagactgac | 2252 |
| tg | 2254 |

<210> 2
 <211> 1575
 <212> DNA
 <213> rabies virus

<220>

<223>

<400> 2

| | |
|---|----|
| atg gtt cct cag gct ctc ctg ttt gta ccc ctt ctg gtt ttt | 42 |
| Met Val Pro Gln Ala Leu Leu Phe Val Pro Leu Leu Val Phe | |
| 1 5 10 | |

| | |
|---|----|
| cca ttg tgt ttt ggg aaa ttc cct att tac acg ata cta gac | 84 |
| Pro Leu Cys Phe Gly Lys Phe Pro Ile Tyr Thr Ile Leu Asp | |
| 15 20 25 | |

| | |
|---|-----|
| aag ctt ggt ccc tgg agc ccg att gac ata cat cac ctc agc | 126 |
| Lys Leu Gly Pro Trp Ser Pro Ile Asp Ile His His Leu Ser | |
| 30 35 40 | |

| | |
|---|-----|
| tgc cca aac aat ttg gta gtg gag gac gaa gga tgc acc aac | 168 |
| Cys Pro Asn Asn Leu Val Val Glu Asp Glu Gly Cys Thr Asn | |
| 45 50 55 | |

| | |
|---|-----|
| ctg tca ggg ttc tcc tac atg gaa ctt aaa gtt gga tac atc | 210 |
| Leu Ser Gly Phe Ser Tyr Met Glu Leu Lys Val Gly Tyr Ile | |
| 60 65 70 | |

| | |
|---|-----|
| tta gcc ata aaa atg aac ggg ttc act tgc aca ggc gtt gtg | 252 |
| Leu Ala Ile Lys Met Asn Gly Phe Thr Cys Thr Gly Val Val | |
| 75 80 | |

| | |
|---|-----|
| acg gag gct gaa acc tac act aac ttc gtt ggt tat gtc aca | 294 |
| Thr Glu Ala Glu Thr Tyr Thr Asn Phe Val Gly Tyr Val Thr | |
| 85 90 95 | |

| | |
|---|-----|
| acc acg ttc aaa aga aag cat ttc cgc cca aca cca gat gca | 336 |
| Thr Thr Phe Lys Arg Lys His Phe Arg Pro Thr Pro Asp Ala | |
| 100 105 110 | |

| | |
|---|-----|
| tgt aga gcc gcg tac aac tgg aag atg gcc ggt gac ccc aga | 378 |
| Cys Arg Ala Ala Tyr Asn Trp Lys Met Ala Gly Asp Pro Arg | |
| 115 120 125 | |

| | |
|---|-----|
| tat gaa gag tct cta cac aat ccg tac cct gac tac cgc tgg | 420 |
| Tyr Glu Glu Ser Leu His Asn Pro Tyr Pro Asp Tyr Arg Trp | |
| 130 135 140 | |

| | |
|---|-----|
| ctt cga act gta aaa acc acc aag gag tct ctc gtt atc ata | 462 |
|---|-----|

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Arg | Thr | Val | Lys | Thr | Thr | Lys | Glu | Ser | Leu | Val | Ile | Ile | |
| | | | | 145 | | | | | 150 | | | | | |
| tct | cca | agt | gta | gca | gat | ttg | gac | cca | tat | gac | aga | tcc | ctt | 504 |
| Ser | Pro | Ser | Val | Ala | Asp | Leu | Asp | Pro | Tyr | Asp | Arg | Ser | Leu | |
| 155 | | | | | 160 | | | | | 165 | | | | |
| cac | tcg | agg | gtc | ttc | cct | agc | ggg | aag | tgc | tca | gga | gta | gcg | 546 |
| His | Ser | Arg | Val | Phe | Pro | Ser | Gly | Lys | Cys | Ser | Gly | Val | Ala | |
| | 170 | | | | | 175 | | | | | 180 | | | |
| gtg | tct | tct | acc | tac | tgc | tcc | act | aac | cac | gat | tac | acc | att | 588 |
| Val | Ser | Ser | Thr | Tyr | Cys | Ser | Thr | Asn | His | Asp | Tyr | Thr | Ile | |
| | | 185 | | | | | 190 | | | | | 195 | | |
| tgg | atg | ccc | gag | aat | ccg | aga | cta | ggg | atg | tct | tgt | gac | att | 630 |
| Trp | Met | Pro | Glu | Asn | Pro | Arg | Leu | Gly | Met | Ser | Cys | Asp | Ile | |
| | | | 200 | | | | | 205 | | | | | 210 | |
| ttt | acc | aat | agt | aga | ggg | aag | aga | gca | tcc | aaa | ggg | agt | gag | 672 |
| Phe | Thr | Asn | Ser | Arg | Gly | Lys | Arg | Ala | Ser | Lys | Gly | Ser | Glu | |
| | | | | 215 | | | | | 220 | | | | | |
| act | tgc | ggc | ttt | gta | gat | gaa | aga | ggc | cta | tat | aag | tct | tta | 714 |
| Thr | Cys | Gly | Phe | Val | Asp | Glu | Arg | Gly | Leu | Tyr | Lys | Ser | Leu | |
| 225 | | | | | 230 | | | | | 235 | | | | |
| aaa | gga | gca | tgc | aaa | ctc | aag | tta | tgt | gga | gtt | cta | gga | ctt | 756 |
| Lys | Gly | Ala | Cys | Lys | Leu | Lys | Leu | Cys | Gly | Val | Leu | Gly | Leu | |
| | 240 | | | | | 245 | | | | | 250 | | | |
| aga | ctt | atg | gat | gga | aca | tgg | gtc | gcg | atg | caa | aca | tca | aat | 798 |
| Arg | Leu | Met | Asp | Gly | Thr | Trp | Val | Ala | Met | Gln | Thr | Ser | Asn | |
| | | 255 | | | | | 260 | | | | | 265 | | |
| gaa | acc | aaa | tgg | tgc | gct | ccc | gat | cag | ttg | gtg | aac | ctg | cac | 840 |
| Glu | Thr | Lys | Trp | Cys | Pro | Pro | Asp | Gln | Leu | Val | Asn | Leu | His | |
| | | | 270 | | | | | 275 | | | | | 280 | |
| gac | ttt | cgc | tca | gac | gaa | att | gag | cac | ctt | gtt | gta | gag | gag | 882 |
| Asp | Phe | Arg | Ser | Asp | Glu | Ile | Glu | His | Leu | Val | Val | Glu | Glu | |
| | | | | 285 | | | | | 290 | | | | | |
| ttg | gtc | agg | aag | aga | gag | gag | tgt | ctg | gat | gca | cta | gag | tcc | 924 |
| Leu | Val | Arg | Lys | Arg | Glu | Glu | Cys | Leu | Asp | Ala | Leu | Glu | Ser | |
| 295 | | | | | 300 | | | | | 305 | | | | |
| atc | atg | aca | aac | aag | tca | gtg | agt | ttc | aga | cgt | ctc | agt | cat | 966 |
| Ile | Met | Thr | Thr | Lys | Ser | Val | Ser | Phe | Arg | Arg | Leu | Ser | His | |
| | 310 | | | | | 315 | | | | | 320 | | | |

| | |
|---|------|
| tta aga aaa ctt gtc cct ggg ttt gga aaa gca tat acc ata | 1008 |
| Leu Arg Lys Leu Val Pro Gly Phe Gly Lys Ala Tyr Thr Ile | |
| 325 330 335 | |
| ttc aac aag acc ttg atg gaa gcc gat gct cac tac aag tca | 1050 |
| Phe Asn Lys Thr Leu Met Glu Ala Asp Ala His Tyr Lys Ser | |
| 340 345 350 | |
| gtc aga act tgg aat gag atc ctc cct tca aaa ggg tgt tta | 1092 |
| Val Arg Thr Trp Asn Glu Ile Leu Pro Ser Lys Gly Cys Leu | |
| 355 360 | |
| aga gtt ggg ggg agg tgt cat cct cat gtg aac ggg gtg ttt | 1134 |
| Arg Val Gly Gly Arg Cys His Pro His Val Asn Gly Val Phe | |
| 365 370 375 | |
| ttc aat ggt ata ata tta gga cct gac ggc aat gtc tta atc | 1176 |
| Phe Asn Gly Ile Ile Leu Gly Pro Asp Gly Asn Val Leu Ile | |
| 380 385 390 | |
| cca gag atg caa tca tcc ctc ctc cag caa cat atg gag ttg | 1218 |
| Pro Glu Met Gln Ser Ser Leu Leu Gln Gln His Met Glu Leu | |
| 395 400 405 | |
| ttg gaa tcc tcg gtt atc ccc ctt gtg cac ccc ctg gca gac | 1260 |
| Leu Glu Ser Ser Val Ile Pro Leu Val His Pro Leu Ala Asp | |
| 410 415 420 | |
| ccg tct acc gtt ttc aag gac ggt gac gag gct gag gat ttt | 1302 |
| Pro Ser Thr Val Phe Lys Asp Gly Asp Glu Ala Glu Asp Phe | |
| 425 430 | |
| gtt gaa gtt cac ctt ccc gat gtg cac aat cag gtc tca gga | 1344 |
| Val Glu Val His Leu Pro Asp Val His Asn Gln Val Ser Gly | |
| 435 440 445 | |
| gtt gac ttg ggt ctc ccg aac tgg ggg aag tat gta tta ctg | 1386 |
| Val Asp Leu Gly Leu Pro Asn Trp Gly Lys Tyr Val Leu Leu | |
| 450 455 460 | |
| agt gca ggg gcc ctg act gcc ttg atg ttg ata att ttc ctg | 1428 |
| Ser Ala Gly Ala Leu Thr Ala Leu Met Leu Ile Ile Phe Leu | |
| 465 470 475 | |
| atg aca tgt tgt aga aga gtc aat cga tca gaa cct acg caa | 1470 |
| Met Thr Cys Cys Arg Arg Val Asn Arg Ser Glu Pro Thr Gln | |
| 480 485 490 | |
| cac aat ctc aga ggg aca ggg agg gag gtg tca gtc act ccc | 1512 |
| His Asn Leu Arg Gly Thr Gly Arg Glu Val Ser Val Thr Pro | |

495

500

caa agc ggg aag atc ata tct tca tgg gaa tca cac aag agt 1554
Gln Ser Gly Lys Ile Ile Ser Ser Trp Glu Ser His Lys Ser
505 510 515

ggg ggt gag acc aga ctg tga 1575
Gly Gly Glu Thr Arg Leu
520

<210> 3
<211> 44
<212> DNA
<213> P11 late promoter and leader sequence

<220>
<223>

<400> 3
taaaaatata gtagaatttc attttgtttt tttctatgct ataa 44

<210> 4
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> forward primer

<400> 4
cgggatccat ttttccttcg tttgccat 28

<210> 5
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> reverse primer

<400> 5
cgggatccga tttctccgtg ataggtat 28

<210> 6
<211> 18
<212> DNA

<213> artificial sequence

<220>

<223> sequencing primer

<400> 6

ctacttgcat agataggt 18

<210> 7

<211> 2007

<212> DNA

<213> feline calicivirus

<220>

<223>

<400> 7

| | |
|---|-----|
| atg tgc tca acc tgc gct aac gtg ctt aaa tac tat gat tgg gat | 45 |
| Met Cys Ser Thr Cys Ala Asn Val Leu Lys Tyr Tyr Asp Trp Asp | |
| 1 5 10 15 | |
| cct cac atc aaa ttg gta atc aac ccc aac aaa ttt cta cat gtt | 90 |
| Pro His Ile Lys Leu Val Ile Asn Pro Asn Lys Phe Leu His Val | |
| 20 25 30 | |
| ggc ttc tgc gat aac cct tta atg tgt tgt tat cct gaa tta cta | 135 |
| Gly Phe Cys Asp Asn Pro Leu Met Cys Cys Tyr Pro Glu Leu Leu | |
| 35 40 45 | |
| cct gaa ttt ggc acc atg tgg gat tgt gat caa tcg cca ctc caa | 180 |
| Pro Glu Phe Gly Thr Met Trp Asp Cys Asp Gln Ser Pro Leu Gln | |
| 50 55 60 | |
| gtc tac ctt gag tca atc ctg ggt gat gat gaa tgg tcc tcc act | 225 |
| Val Tyr Leu Glu Ser Ile Leu Gly Asp Asp Glu Trp Ser Ser Thr | |
| 65 70 75 | |
| cat gaa gca att gac cca gtt gtg cca cca atg cat tgg gat gaa | 270 |
| His Glu Ala Ile Asp Pro Val Val Pro Pro Met His Trp Asp Glu | |
| 80 85 90 | |
| gcc gga aaa atc ttc caa cca cac cct ggc gtc ctt atg cat cac | 315 |
| Ala Gly Lys Ile Phe Gln Pro His Pro Gly Val Leu Met His His | |
| 95 100 105 | |
| ctc atc tgt aag gtt gca gaa gga tgg gac cca aac ctg cca ctt | 360 |
| Leu Ile Cys Lys Val Ala Glu Gly Trp Asp Pro Asn Leu Pro Leu | |
| 110 115 120 | |
| ttc cgc ttg gaa gcg gac gat ggt tcc atc acg aca cct gaa cag | 405 |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Phe | Arg | Leu | Glu | Ala | Asp | Asp | Gly | Ser | Ile | Thr | Thr | Pro | Glu | Gln | | |
| | | | | 125 | | | | | 130 | | | | | 135 | | |
| gga | aca | atg | gtt | ggt | gga | gtc | att | gct | gag | ccc | aac | gcc | caa | atg | 450 | |
| Gly | Thr | Met | Val | Gly | Gly | Val | Ile | Ala | Glu | Pro | Asn | Ala | Gln | Met | | |
| | | | | 140 | | | | | 145 | | | | | 150 | | |
| tca | acc | gca | gct | gac | atg | gcc | act | ggg | aaa | agt | gtg | gac | tct | gag | 495 | |
| Ser | Thr | Ala | Ala | Asp | Met | Ala | Thr | Gly | Lys | Ser | Val | Asp | Ser | Glu | | |
| | | | | 155 | | | | | 160 | | | | | 165 | | |
| tgg | gaa | gcc | ttc | ttc | tcc | ttt | cac | act | agt | gtg | aac | tgg | agc | aca | 540 | |
| Trp | Glu | Ala | Phe | Phe | Ser | Phe | His | Thr | Ser | Val | Asn | Trp | Ser | Thr | | |
| | | | | 170 | | | | | 175 | | | | | 180 | | |
| tct | gaa | act | cag | ggg | aag | ata | ctc | ttt | aaa | caa | tcc | tta | gga | cca | 585 | |
| Ser | Glu | Thr | Gln | Gly | Lys | Ile | Leu | Phe | Lys | Gln | Ser | Leu | Gly | Pro | | |
| | | | | 185 | | | | | 190 | | | | | 195 | | |
| ttg | ctc | aac | ccc | tac | ctt | acc | cat | ctt | gca | aag | ctg | tat | gtt | gct | 630 | |
| Leu | Leu | Asn | Pro | Tyr | Leu | Thr | His | Leu | Ala | Lys | Leu | Tyr | Val | Ala | | |
| | | | | 200 | | | | | 205 | | | | | 210 | | |
| tgg | tct | ggt | tct | gtt | gat | gtt | agg | ttt | tct | att | tct | gga | tct | ggt | 675 | |
| Trp | Ser | Gly | Ser | Val | Asp | Val | Arg | Phe | Ser | Ile | Ser | Gly | Ser | Gly | | |
| | | | | 215 | | | | | 220 | | | | | 225 | | |
| gtc | ttt | gga | ggg | aaa | tta | gct | gct | att | gtt | gtg | ccg | cca | gga | att | 720 | |
| Val | Phe | Gly | Gly | Lys | Leu | Ala | Ala | Ile | Val | Val | Pro | Pro | Gly | Ile | | |
| | | | | 230 | | | | | 235 | | | | | 240 | | |
| gat | cct | gtt | caa | agt | act | tca | atg | ctg | caa | tat | cct | cat | gtc | ctc | 765 | |
| Asp | Pro | Val | Gln | Ser | Thr | Ser | Met | Leu | Gln | Tyr | Pro | His | Val | Leu | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | |
| ttt | gat | gct | cgt | caa | gtt | gaa | cct | gtt | atc | ttt | tcc | att | ccc | gat | 810 | |
| Phe | Asp | Ala | Arg | Gln | Val | Glu | Pro | Val | Ile | Phe | Ser | Ile | Pro | Asp | | |
| | | | | 260 | | | | | 265 | | | | | 270 | | |
| cta | aga | agc | acc | tta | tat | cac | ctt | atg | tct | gac | act | gat | acc | aca | 855 | |
| Leu | Arg | Ser | Thr | Leu | Tyr | His | Leu | Met | Ser | Asp | Thr | Asp | Thr | Thr | | |
| | | | | 275 | | | | | 280 | | | | | 285 | | |
| tcg | ttg | gta | atc | atg | gtg | tac | aat | gat | ctt | att | aac | ccc | tat | gct | 900 | |
| Ser | Leu | Val | Ile | Met | Val | Tyr | Asn | Asp | Leu | Ile | Asn | Pro | Tyr | Ala | | |
| | | | | 290 | | | | | 295 | | | | | 300 | | |
| aat | gac | tca | aac | tct | tcg | ggc | tgc | att | gtc | act | gtg | gaa | act | aaa | 945 | |
| Asn | Asp | Ser | Asn | Ser | Ser | Gly | Cys | Ile | Val | Thr | Val | Glu | Thr | Lys | | |
| | | | | 305 | | | | | 310 | | | | | 315 | | |

| | |
|---|------|
| ccg ggg cca gat ttc aag ttt cac ctc tta aaa cct cct ggg tct | 990 |
| Pro Gly Pro Asp Phe Lys Phe His Leu Leu Lys Pro Pro Gly Ser | |
| 320 325 330 | |
| atg tta act cac gga tct atc cca tct gat cta atc cca aaa tca | 1035 |
| Met Leu Thr His Gly Ser Ile Pro Ser Asp Leu Ile Pro Lys Ser | |
| 335 340 345 | |
| tct tcg ctt tgg att gga aat cgg ttt tgg tct gac ata acc gat | 1080 |
| Ser Ser Leu Trp Ile Gly Asn Arg Phe Trp Ser Asp Ile Thr Asp | |
| 350 355 360 | |
| ttt gta att cgg cct ttt gtg ttc cag gca aat cga cac ttt gat | 1125 |
| Phe Val Ile Arg Pro Phe Val Phe Gln Ala Asn Arg His Phe Asp | |
| 365 370 375 | |
| ttc aac caa gag aca gca ggt tgg agc acc cca agg ttt cgc cca | 1170 |
| Phe Asn Gln Glu Thr Ala Gly Trp Ser Thr Pro Arg Phe Arg Pro | |
| 380 385 390 | |
| att act atc act atc agt gtt aag gag tca gca aag ctt ggt att | 1215 |
| Ile Thr Ile Thr Ile Ser Val Lys Glu Ser Ala Lys Leu Gly Ile | |
| 395 400 405 | |
| gga gtg gcc acc gac tac att gtt ccc ggc ata cca gat gga tgg | 1260 |
| Gly Val Ala Thr Asp Tyr Ile Val Pro Gly Ile Pro Asp Gly Trp | |
| 410 415 420 | |
| ccc gac aca aca atc cca ggt gag ttg gta cct gtt ggt gac tat | 1305 |
| Pro Asp Thr Thr Ile Pro Gly Glu Leu Val Pro Val Gly Asp Tyr | |
| 425 430 435 | |
| gcc atc act aat ggc acc aac aat gat atc acc aca gct gcg cag | 1350 |
| Ala Ile Thr Asn Gly Thr Asn Asn Asp Ile Thr Thr Ala Ala Gln | |
| 440 445 450 | |
| tac gat gca gcc act gag att aga aac aac acc aat ttc aga ggc | 1395 |
| Tyr Asp Ala Ala Thr Glu Ile Arg Asn Asn Thr Asn Phe Arg Gly | |
| 455 460 465 | |
| atg tac att tgt ggt tct ctt caa aga gct tgg ggg gat aag aag | 1440 |
| Met Tyr Ile Cys Gly Ser Leu Gln Arg Ala Trp Gly Asp Lys Lys | |
| 470 475 480 | |
| att tca aat act gct ttt atc aca acc ggc acg gtt gat gga gcc | 1485 |
| Ile Ser Asn Thr Ala Phe Ile Thr Thr Gly Thr Val Asp Gly Ala | |
| 485 490 495 | |
| aaa ttg ata ccc agt aat acc att gac caa aca aaa att gcc gta | 1530 |
| Lys Leu Ile Pro Ser Asn Thr Ile Asp Gln Thr Lys Ile Ala Val | |
| 500 505 510 | |

| | |
|---|------|
| ttc caa gac aca cat gcg aat aag cat gtc cag acc tcg gac gac | 1575 |
| Phe Gln Asp Thr His Ala Asn Lys His Val Gln Thr Ser Asp Asp | |
| 515 520 525 | |
| aca ttg gcc ctg ctt ggt tat act ggt att ggt gag gaa gca att | 1620 |
| Thr Leu Ala Leu Leu Gly Tyr Thr Gly Ile Gly Glu Glu Ala Ile | |
| 530 535 540 | |
| ggt gct gac cgc gat aga gtt gtg cga att agc gtc ctc ccg gaa | 1665 |
| Gly Ala Asp Arg Asp Arg Val Val Arg Ile Ser Val Leu Pro Glu | |
| 545 550 555 | |
| cgt ggc gca cgt ggt ggc aat cac cca atc ttc cac aaa aac tct | 1710 |
| Arg Gly Ala Arg Gly Gly Asn His Pro Ile Phe His Lys Asn Ser | |
| 560 565 570 | |
| atc aag ctt ggt tat gta att agg tcc att gat gtg ttc aat tct | 1755 |
| Ile Lys Leu Gly Tyr Val Ile Arg Ser Ile Asp Val Phe Asn Ser | |
| 575 580 585 | |
| caa att ctg cat acc tct agg caa ctt tcc ctc aat cat tac tta | 1800 |
| Gln Ile Leu His Thr Ser Arg Gln Leu Ser Leu Asn His Tyr Leu | |
| 590 595 600 | |
| ttg tcg cct gac tcc ttt gct gtc tat agg att att gac tct aat | 1845 |
| Leu Ser Pro Asp Ser Phe Ala Val Tyr Arg Ile Ile Asp Ser Asn | |
| 605 610 615 | |
| gga tcc tgg ttt gac ata ggc att gat aat gat gga ttt tct ttt | 1890 |
| Gly Ser Trp Phe Asp Ile Gly Ile Asp Asn Asp Gly Phe Ser Phe | |
| 620 625 630 | |
| gtt ggt gta tca agt att ggt aaa tta gag ttt cct tta act gcc | 1935 |
| Val Gly Val Ser Ser Ile Gly Lys Leu Glu Phe Pro Leu Thr Ala | |
| 635 640 645 | |
| tcc tac atg gga att caa ttg gca aaa att cga ctt gcc tct aac | 1980 |
| Ser Tyr Met Gly Ile Gln Leu Ala Lys Ile Arg Leu Ala Ser Asn | |
| 650 655 660 | |
| att agg agt gtg atg aca aaa tta tga | 2007 |
| Ile Arg Ser Val Met Thr Lys Leu | |
| 665 | |

<210> 8

<211> 582

<212> DNA

<213> artificial sequence

<220>

<223> hemagglutinin left arm

<400> 8

| | | | | | |
|------------|------------|------------|------------|------------|-----|
| attaaacgca | aatatccatg | gaaaacgcgc | agtatacaga | cgatttttta | 50 |
| cagtatttgg | agagttttat | aggaagtata | tagagtagaa | ccagaatttt | 100 |
| gtaaaaataa | atcacatttt | tatactaata | tgaaacaact | atcgatagtt | 150 |
| atattgctac | tatcgatagt | atatacaacc | aaacctcatc | ctacacagat | 200 |
| atcaaaaaaa | ctaggcgatg | atgctactct | atcgtgtaat | agaaacaata | 250 |
| cacatggata | tcttgtcatg | agttcttggt | ataagaaacc | agactccatt | 300 |
| attctcttag | cagccaaaaa | cgatgtcgta | tactttgatg | attatacagc | 350 |
| ggataaagta | tcatacgatt | caccgtatga | tactctagct | acaattatta | 400 |
| caattaaatc | attgacatct | gcagatgcag | gtacttatat | atgcgcattc | 450 |
| tttataacat | caacaaatga | tacggataaa | atagattatg | aagaatactt | 500 |
| catagatttg | gttgtaaadc | cagctaattg | atccactatt | gacgcgattc | 550 |
| tatcaggatc | taatttctcc | gtgataggta | tc | | 582 |

<210> 9

<211> 447

<212> DNA

<213> artificial sequence

<220>

<223> hemagglutinin right arm

<400> 9

| | | | | | |
|-------------|------------|------------|------------|------------|-----|
| ctctagcgcc | taaccccagg | cgaccgacga | caacctttat | gatacatata | 50 |
| atgaaccaat | atctgtatca | tcctcgatac | caacaacggt | agaaagtgtt | 100 |
| acaatatcta | ctacaaaata | tacaactagt | gactttatag | agatatttgg | 150 |
| cattgtttca | ctaattttat | tattggccgt | ggcgattttc | tgtattatat | 200 |
| tatttctgta | gtggacggtc | tcgtaaacaa | gaaacaaata | tattatagat | 250 |
| tttaactcag | ataaatgtct | ggaataatta | aatctatcgt | tttgagcgga | 300 |
| ccatctgggt | ccggcaagac | agctatagtc | aggagactct | tacaagatta | 350 |
| tggaatatata | tttggaattg | tggtatccca | taccactaga | tttcctcgtc | 400 |
| ctatggaacg | agaaggtgtc | gactaccatt | acgttaacag | agaggcc | 447 |

<210> 10

<211> 40

<212> DNA

<213> artificial sequence

<220>

<223> primer P3

<400> 10

gatacctatc acggagaaat tagatcctga tagaatcgcg 40

<210> 11

<211> 22

<212> DNA
<213> artificial sequence

<220>
<223> primer P1

<400> 11
attaaacgca aatatccatg gg 22

<210> 12
<211> 27
<212> DNA
<213> artificial sequence

<220>
<223> primer F2

<400> 12
gcggtaccct ggggttaggc gatagag 27

<210> 13
<211> 20
<212> DNA
<213> artificial sequence

<220>
<223> primer P5

<400> 13
atttctccgt gataggtatc 20

<210> 14
<211> 22
<212> DNA
<213> artificial sequence

<220>
<223> primer P5

<400> 14
ggcctctctg ttaacgtaat gg 22

<210> 15
<211> 22
<212> DNA
<213> artificial sequence

<220>
<223> primer P2

<400> 15
gcgtcgaagt ttgagcatgt gc 22

<210> 16
<211> 40
<212> DNA
<213> artificial sequence

<220>
<223> primer P4

<400> 16
ctctagcgcc taaccccagg cgaccgacga caacctttat 40

<210> 17
<211> 840
<212> DNA
<213> feline infectious peritonitis virus

<220>
<223>

<400> 17
aaaccaaggc atataatccc gacgaagcat ttttggtttg aactaaacaa a 51

atg aag tac att ttg cta ata ctc gcg tgc ata att gca tgc gtt 96
Met Lys Tyr Ile Leu Leu Ile Leu Ala Cys Ile Ile Ala Cys Val
1 5 10 15

tat ggt gaa cgc tac tgt gcc atg caa gac agt ggc ttg cag tgt 141
Tyr Gly Glu Arg Tyr Cys Ala Met Gln Asp Ser Gly Leu Gln Cys
20 25 30

att aat ggc aca aat tca aga tgt caa acc tgc ttt gaa cgt ggt 186
Ile Gln Gly Thr Gln Ser Arg Cys Gln Thr Cys Phe Glu Arg Gly
35 40 45

gat ctt att tgg cat ctt gct aac tgg aac ttc agc tgg tct gta 231
Asp Leu Ile Trp His Leu Ala Asn Trp Asn Phe Ser Trp Ser Val
50 55 60

ata ttg att gtt ttt ata aca gtg tta caa tat ggc aga cca caa 276
Ile Leu Ile Val Phe Ile Thr Val Leu Gln Tyr Gly Arg Pro Gln
65 70 75

| | |
|---|-----|
| ttt agc tgg ctc gtt tat ggc att aaa atg ctg atc atg tgg cta | 321 |
| Phe Ser Trp Leu Val Tyr Gly Ile Lys Met Leu Ile Met Trp Leu | |
| 80 85 90 | |
| tta tgg cct att gtt cta gcg ctt acg att ttt aat gca tac tct | 366 |
| Leu Trp Pro Ile Val Leu Ala Leu Thr Ile Phe Asn Ala Tyr Ser | |
| 95 100 105 | |
| gag tac caa gtt tcc aga tat gta atg ttc ggc ttt agt gtt gca | 411 |
| Glu Tyr Gln Val Ser Arg Tyr Val Met Phe Gly Phe Ser Val Ala | |
| 110 115 120 | |
| ggt gca gtt gta acg ttt gca ctt tgg atg atg tat ttt gtg aga | 456 |
| Gly Ala Val Val Thr Phe Ala Leu Trp Met Met Tyr Phe Val Arg | |
| 125 130 135 | |
| tct gtt cag cta tat aga aga acc aaa tca tgg tgg tct ttt aat | 501 |
| Ser Val Gln Leu Tyr Arg Arg Thr Lys Ser Trp Trp Ser Phe Asn | |
| 140 145 150 | |
| cct gag act aat gca att ctt tgt gtt aat gca ttg ggt aga agt | 546 |
| Pro Glu Thr Asn Ala Ile Leu Cys Val Asn Ala Leu Gly Arg Ser | |
| 155 160 165 | |
| tat gtg ctt ccc tta gat ggt act cct aca ggt gtt acc ctt act | 591 |
| Tyr Val Leu Pro Leu Asp Gly Thr Pro Thr Gly Val Thr Leu Thr | |
| 170 175 180 | |
| cta ctt tca gga aat cta tat gct gaa ggt ttc aaa atg gct ggt | 636 |
| Leu Leu Ser Gly Asn Leu Tyr Ala Glu Gly Phe Lys Met Ala Gly | |
| 185 190 195 | |
| ggt tta acc atc gag cat ttg cct aaa tac gtc atg att gct aca | 681 |
| Gly Leu Thr Ile Glu His Leu Pro Lys Tyr Val Met Ile Ala Thr | |
| 200 205 210 | |
| cct agt aga acc atc gtt tat aca tta gtt gga aaa caa tta aaa | 726 |
| Pro Ser Arg Thr Ile Val Tyr Thr Ile Val Gly Lys Gln Leu Lys | |
| 215 220 225 | |
| gca act act gcc aca gga tgg gct tac tac gta aaa tct aaa gct | 771 |
| Ala Thr Thr Ala Thr Gly Trp Ala Tyr Tyr Val Lys Ser Lys Ala | |
| 230 235 240 | |
| ggt gat tac tca aca gaa gca cgt act gac aat ttg agt gaa cat | 816 |
| Gly Asp Tyr Ser Thr Glu Ala Arg Thr Asp Asn Leu Ser Glu His | |
| 245 250 255 | |
| gaa aaa tta tta cat atg gtg taa | 840 |
| Glu Lys Leu Leu His Met Val | |
| 260 | |

<210> 18
 <211> 1144
 <212> DNA
 <213> feline infectious peritonitis virus

<220>

<223>

<400> 18

| | |
|---|-----|
| atg gcc aca cag gga caa cgc gtc aac tgg gga gat gaa cct tcc | 45 |
| Met Ala Thr Gln Gly Gln Arg Val Asn Trp Gly Asp Glu Pro Ser | |
| 1 5 10 15 | |
| aaa aga cgt ggt cgt tct aac tct cgt ggt cgg aag aat aat gat | 90 |
| Lys Arg Arg Gly Arg Ser Asn Ser Arg Gly Arg Lys Asn Asn Asp | |
| 20 25 30 | |
| ata cct ttg tca ttc tac aac ccc att acc ctc gaa caa gga tct | 135 |
| Ile Pro Leu Ser Phe Tyr Asn Phe Ile Thr Leu Glu Gln Glu Ser | |
| 35 40 45 | |
| aaa ttt tgg aat tta tgt ccg aga gac ctt gtt ccc aaa gga ata | 180 |
| Lys Phe Trp Asn Leu Cys Pro Arg Asp Leu Val Pro Lys Gly Ile | |
| 50 55 60 | |
| ggt aat aag gat caa caa att ggt tat tgg aat aga cag att cgt | 225 |
| Gly Asn Lys Asp Gln Gln Ile Gly Tyr Trp Asn Arg Gln Ile Arg | |
| 65 70 75 | |
| tat cgt att gta aaa ggc cag cgt aag gaa ctc gct gag agg tgg | 270 |
| Tyr Arg Ile Val Lys Gly Gln Arg Lys Glu Leu Ala Glu Arg Trp | |
| 80 85 90 | |
| ttc ttt tac ttc tta ggt aca gga cct cat gct gat gct aaa ttc | 315 |
| Phe Phe Tyr Phe Leu Gly Thr Gly Phe His Ala Asp Ala Lys Phe | |
| 95 100 105 | |
| aaa gac aag att gat gga gtc ttc tgg gtt gca agg gat ggt gcc | 360 |
| Lys Asp Lys Ile Asp Gly Val Phe Trp Val Ala Arg Asp Gly Ala | |
| 110 115 120 | |
| atg aac aag ccc aca acg ctt ggc act cgt gga acc aat aac gaa | 405 |
| Met Asn Lys Pro Thr Thr Leu Gly Thr Arg Gly Thr Asn Asn Glu | |
| 125 130 135 | |
| tcc aaa cca ctg aga ttt gat ggt aag ata ccg cca cag ttt cag | 450 |
| Ser Lys Pro Leu Arg Phe Asp Gly Lys Ile Pro Pro Gln Phe Gln | |
| 140 145 150 | |
| ctt gaa gtg aac cgt tct agg aac aat tca agg tct ggt tct cag | 495 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Leu | Glu | Val | Asn | Arg | Ser | Arg | Asn | Asn | Ser | Arg | Ser | Gly | Ser | Gln | |
| | | | | 155 | | | | | 160 | | | | | 165 | |
| tct | aga | tct | gtt | tca | aga | aac | aga | tct | caa | tct | aga | gga | aga | cac | 540 |
| Ser | Arg | Ser | Val | Ser | Arg | Asn | Arg | Ser | Gln | Ser | Arg | Gly | Arg | His | |
| | | | | 170 | | | | | 175 | | | | | 180 | |
| cat | tcc | aat | aac | cag | aat | aat | aat | gtt | gag | gat | aca | att | gta | gcc | 585 |
| His | Ser | Asn | Asn | Gln | Asn | Asn | Asn | Val | Glu | Asp | Thr | Ile | Val | Ala | |
| | | | | 185 | | | | | 190 | | | | | 195 | |
| gtg | ctt | gaa | aaa | tta | ggc | gtt | act | gac | aaa | caa | agg | tca | cgt | tct | 630 |
| Val | Leu | Glu | Lys | Leu | Gly | Val | Thr | Asp | Lys | Gln | Arg | Ser | Arg | Ser | |
| | | | | 200 | | | | | 205 | | | | | 210 | |
| aaa | cct | aga | gaa | cgt | agt | gat | tcc | aaa | cct | agg | gac | aca | aca | cct | 675 |
| Lys | Pro | Arg | Glu | Arg | Ser | Asp | Ser | Lys | Pro | Arg | Asp | Thr | Thr | Pro | |
| | | | | 215 | | | | | 220 | | | | | 225 | |
| aag | aat | gcc | aac | aaa | cac | acc | tgg | aag | aaa | act | gca | ggc | aag | gga | 720 |
| Lys | Asn | Ala | Asn | Lys | His | Thr | Trp | Lys | Lys | Thr | Ala | Gly | Lys | Gly | |
| | | | | 230 | | | | | 235 | | | | | 240 | |
| gat | gtg | aca | act | ttc | tat | ggc | gct | aga | agt | agt | tca | gct | aac | ttt | 765 |
| Asp | Val | Thr | Thr | Phe | Tyr | Gly | Ala | Arg | Ser | Ser | Ser | Ala | Asn | Phe | |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| ggc | gat | agt | gat | ctc | gtt | gcc | aat | ggc | aac | gct | gcc | aaa | tgc | tac | 810 |
| Gly | Asp | Ser | Asp | Leu | Val | Ala | Asn | Gly | Asn | Ala | Ala | Lys | Cys | Tyr | |
| | | | | 260 | | | | | 265 | | | | | 270 | |
| cct | cag | ata | gct | gaa | tgt | gtt | cca | tca | gtg | tct | agc | ata | atc | ttt | 855 |
| Pro | Gln | Ile | Ala | Glu | Cys | Val | Pro | Ser | Val | Ser | Ser | Ile | Ile | Phe | |
| | | | | 275 | | | | | 280 | | | | | 285 | |
| ggc | agt | caa | tgg | tct | gct | gaa | gaa | gct | ggc | gat | caa | gtg | aaa | gtc | 900 |
| Gly | Ser | Gln | Trp | Ser | Ala | Glu | Glu | Ala | Gly | Asp | Gln | Val | Lys | Val | |
| | | | | 290 | | | | | 295 | | | | | 300 | |
| acg | ctc | act | cac | acc | tac | tac | ctg | cca | aag | gat | gat | gcc | aaa | act | 945 |
| Thr | Leu | Thr | His | Thr | Tyr | Tyr | Leu | Pro | Lys | Asp | Asp | Ala | Lys | Thr | |
| | | | | 305 | | | | | 310 | | | | | 315 | |
| agt | caa | ttc | cta | gaa | cag | att | gac | gct | tac | aag | cga | cct | tct | gaa | 990 |
| Ser | Gln | Phe | Leu | Glu | Gln | Ile | Asp | Ala | Tyr | Lys | Atg | Pro | Ser | Glu | |
| | | | | 320 | | | | | 325 | | | | | 330 | |
| gtg | gct | aag | gat | cag | agg | caa | aga | aga | tcc | cgt | tct | aag | tct | gct | 1035 |
| Val | Ala | Lys | Asp | Gln | Arg | Gln | Arg | Arg | Ser | Arg | Ser | Lys | Ser | Ala | |
| | | | | 335 | | | | | 340 | | | | | 345 | |

| | |
|---|------|
| gat aag aag cct gag gag ttg tct gta act ctt gtg gag gca tac | 1080 |
| Asp Lys Lys Pro Glu Glu Lys Ser Val Thr Leu Val Glu Ala Tyr | |
| 350 355 360 | |

| | |
|---|------|
| aca gat gtg ttt gat gac aca cag gtt gag atg att gat gag gtt | 1125 |
| Thr Asp Val Phe Asp Asp Thr Gln Val Glu Met Ile Asp Glu Val | |
| 365 370 375 | |

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|------------------------|------|
| acg aac taa acgcatgctc | 1144 |
| Thr Asn | |

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|--|----|

| | |
|---|----|
| atg gaa agt cca acg cac cca aaa ccc tct aaa gat aag act ctc | 95 |
| Met Glu Ser Pro Thr His Pro Lys Pro Ser Lys Asp Lys Thr Leu | |
| 1 5 10 15 | |

| | |
|---|-----|
| tcg tgg aac tta gcg ttt ctg gtg ggg atc tta ttt aca ata gac | 140 |
| Ser Trp Asn Leu Ala Phe Leu Val Gly Ile Leu Phe Thr Ile Asp | |
| 20 25 30 | |

| | |
|---|-----|
| ata gga atg gcc aat cct agt cca cac caa ata tat aat gta act | 185 |
| Ile Gly Met Ala Asn Pro Ser Pro His Gln Ile Tyr Asn Val Thr | |
| 35 40 45 | |

| | |
|---|-----|
| tgg gta ata acc aat gta caa act aac acc caa gct aac gcc acc | 230 |
| Trp Val Ile Thr Asn Val Gln Thr Asn Thr Gln Ala Asn Ala Thr | |
| 50 55 60 | |

| | |
|---|-----|
| tct atg tta gga acc tta acc gat gcc tac cct acc cta cat gtt | 275 |
| Ser Met Leu Gly Thr Leu Thr Asp Ala Tyr Pro Thr Leu His Val | |
| 65 70 75 | |

| | |
|---|-----|
| gac tta tgt gac cta gtg gga gac acc tgg gaa cct ata gtc cta | 320 |
| Asp Leu Cys Asp Leu Val Gly Asp Thr Trp Glu Pro Ile Val Leu | |
| 80 85 90 | |

| | |
|---|-----|
| aac cca acc aat gta aaa cac ggg gca cgt tac tcc tcc tca aaa | 365 |
| Asn Pro Thr Asn Val Lys His Gly Ala Arg Tyr Ser Ser Ser Lys | |
| 95 100 105 | |

| | |
|---|-----|
| tat gga tgt aaa act aca gat aga aaa aaa cag caa cag aca tac | 410 |
| Tyr Gly Cys Lys Thr Thr Asp Arg Lys Lys Gln Gln Gln Thr Tyr | |
| 110 115 120 | |
| ccc ttt tac gtc tgc ccc gga cat gcc ccc tcg ttg ggg cca aag | 455 |
| Pro Phe Tyr Val Cys Pro Gly His Ala Pro Ser Leu Gly Pro Lys | |
| 125 130 135 | |
| gga aca cat tgt gga ggg gca caa gat ggg ttt tgt gcc gca tgg | 500 |
| Gly Thr His Cys Gly Gly Ala Gln Asp Gly Phe Cys Ala Ala Trp | |
| 140 145 150 | |
| gga tgt gag acc acc gga gaa gct tgg tgg aag ccc acc tcc tca | 545 |
| Gly Cys Glu Thr Thr Gly Glu Thr Trp Trp Lys Pro Thr Ser Ser | |
| 155 160 165 | |
| tgg gac tat atc aca gta aaa aga ggg agt agt cag gac aat agc | 590 |
| Trp Asp Tyr Ile Thr Val Lys Arg Gly Ser Ser Gln Asp Asn Ser | |
| 170 175 180 | |
| tgt gag gga aaa tgc aac ccc ctg gtt ttg cag ttc acc cag aag | 635 |
| Cys Glu Gly Lys Cys Asn Pro Leu Val Leu Gln Phe Thr Gln Lys | |
| 185 190 195 | |
| gga aga caa gcc tct tgg gac gga cct aag atg tgg gga ttg cga | 680 |
| Gly Arg Gln Ala Ser Trp Asp Gly Pro Lys Met Trp Gly Leu Arg | |
| 200 205 210 | |
| cta tac cgt aca gga tat gac cct atc gct tta ttc acg gtg tcc | 725 |
| Leu Tyr Arg Thr Gly Tyr Asp Pro Ile Ala Leu Phe Thr Val Ser | |
| 215 220 225 | |
| cgg cag gta tca acc att acg ccg cct cag gca atg gga cca aac | 770 |
| Arg Gln Val Ser Thr Ile Thr Pro Pro Gln Ala Met Gly Pro Asn | |
| 230 235 240 | |
| cta gtc tta cct gat caa aaa ccc cca tcc cga caa tct caa aca | 815 |
| Leu Val Leu Pro Asp Gln Lys Pro Pro Ser Arg Gln Ser Gln Thr | |
| 245 250 255 | |
| ggg tcc aaa gtg gcg acc cag agg ccc caa acg aat gaa agc gcc | 860 |
| Gly Ser Lys Val Ala Thr Gln Arg Pro Gln Thr Asn Glu Ser Ala | |
| 260 265 270 | |
| cca agg tct gtt gcc ccc acc acc atg ggt ccc aaa cgg att ggg | 905 |
| Pro Arg Ser Val Ala Pro Thr Thr Met Gly Pro Lys Arg Ile Gly | |
| 275 280 285 | |
| acc gga gat agg tta ata aat tta gta caa ggg aca tac cta gcc | 950 |
| Thr Gly Asp Arg Leu Ile Asn Leu Val Gln Gly Thr Tyr Leu Ala | |

| 290 | | | | | | | | | | 295 | | | | | 300 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|--|--|--|
| tta | aat | gcc | acc | gac | ccc | aac | aaa | act | aaa | gac | tgt | tgg | ctc | tgc | 995 | | | | | |
| Leu | Asn | Ala | Thr | Asp | Pro | Asn | Lys | Thr | Lys | Asp | Cys | Trp | Leu | Cys | | | | | | |
| | | | | 305 | | | | | 310 | | | | | 315 | | | | | | |
| ctg | gtt | tct | cga | cca | ccc | tat | tac | gaa | ggg | att | gca | atc | tta | ggt | 1040 | | | | | |
| Leu | Val | Ser | Arg | Pro | Pro | Tyr | Tyr | Glu | Gly | Ile | Ala | Ile | Leu | Gly | | | | | | |
| | | | | 320 | | | | | 325 | | | | | 330 | | | | | | |
| acc | tac | agc | aac | caa | aca | aac | ccc | ccc | cca | tcc | tgc | cta | tct | act | 1085 | | | | | |
| Asn | Tyr | Ser | Asn | Gln | Thr | Asn | Pro | Pro | Pro | Ser | Cys | Leu | Ser | Ile | | | | | | |
| | | | | 335 | | | | | 340 | | | | | 345 | | | | | | |
| ccg | caa | cac | aaa | cta | act | ata | tct | gaa | gta | tca | ggg | caa | gga | atg | 1130 | | | | | |
| Pro | Gln | His | Lys | Leu | Thr | Ile | Ser | Glu | Val | Ser | Gly | Gln | Gly | Met | | | | | | |
| | | | | 350 | | | | | 355 | | | | | 360 | | | | | | |
| tgc | ata | ggg | act | gtt | cct | aaa | acc | cac | cag | gct | ttg | tgc | aat | aag | 1175 | | | | | |
| Cys | Ile | Gly | Thr | Val | Pro | Lys | Thr | His | Gln | Ala | Leu | Cys | Asn | Lys | | | | | | |
| | | | | 365 | | | | | 370 | | | | | 375 | | | | | | |
| aca | caa | cag | gga | cat | aca | ggg | gcg | cac | tat | cta | gcc | gcc | ccc | aac | 1220 | | | | | |
| Thr | Gln | Gln | Gly | His | Thr | Gly | Ala | His | Tyr | Leu | Ala | Ala | Pro | Asn | | | | | | |
| | | | | 380 | | | | | 385 | | | | | 390 | | | | | | |
| ggc | acc | tat | tgg | gcc | tgt | aac | act | gga | ctc | acc | cca | tgc | att | tcc | 1265 | | | | | |
| Gly | Thr | Tyr | Trp | Ala | Cys | Asn | Thr | Gly | Leu | Thr | Pro | Cys | Ile | Ser | | | | | | |
| | | | | 395 | | | | | 400 | | | | | 405 | | | | | | |
| atg | gcg | gtg | ctc | aat | tgg | acc | tct | gat | ttt | tgt | gtc | tta | atc | gaa | 1310 | | | | | |
| Met | Ala | Val | Leu | Asn | Trp | Thr | Ser | Asp | Phe | Cys | Val | Leu | Ile | Glu | | | | | | |
| | | | | 410 | | | | | 415 | | | | | 420 | | | | | | |
| tta | tgg | ccc | aga | gtg | act | tac | cat | caa | ccc | gaa | tat | gtg | tac | aca | 1355 | | | | | |
| Leu | Trp | Pro | Arg | Val | Thr | Tyr | His | Gln | Pro | Glu | Tyr | Val | Tyr | Thr | | | | | | |
| | | | | 425 | | | | | 430 | | | | | 435 | | | | | | |
| cat | ttt | gcc | aaa | gct | gtc | agg | ttc | cga | aga | gaa | cca | ata | tca | cta | 1400 | | | | | |
| His | Phe | Ala | Lys | Ala | Val | Arg | Phe | Arg | Arg | Glu | Pro | Ile | Ser | Leu | | | | | | |
| | | | | 440 | | | | | 445 | | | | | 450 | | | | | | |
| acg | gtt | gcc | ctt | atg | ttg | gga | gga | ctt | act | gta | ggg | ggc | ata | gcc | 1445 | | | | | |
| Thr | Val | Ala | Leu | Met | Leu | Gly | Gly | Leu | Thr | Val | Gly | Gly | Ile | Ala | | | | | | |
| | | | | 455 | | | | | 460 | | | | | 465 | | | | | | |
| gcg | ggg | gtc | gga | aca | ggg | act | aaa | gcc | ctc | ctt | gaa | aca | gcc | cag | 1490 | | | | | |
| Ala | Gly | Val | Gly | Thr | Gly | Thr | Lys | Ala | Leu | Leu | Glu | Thr | Ala | Gln | | | | | | |
| | | | | 470 | | | | | 475 | | | | | 480 | | | | | | |
| ttc | aga | caa | cta | caa | atg | gcc | atg | cac | aca | gac | atc | cag | gcc | cta | 1535 | | | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Phe | Arg | Gln | Leu | Gln | Met | Ala | Met | His | Thr | Asp | Ile | Gln | Ala | Leu | | |
| | | | | 485 | | | | | 490 | | | | | 495 | | |
| gaa | gaa | tca | att | agt | gcc | tta | gaa | aag | tcc | ctg | acc | tcc | ctt | tct | 1580 | |
| Glu | Glu | Ser | Ile | Ser | Ala | Leu | Glu | Lys | Ser | Leu | Thr | Ser | Leu | Ser | | |
| | | | | 500 | | | | | 505 | | | | | 510 | | |
| gaa | gta | gtc | tta | caa | aac | aga | cgg | ggc | cta | gat | att | cta | ttc | tta | 1625 | |
| Glu | Val | Val | Leu | Gln | Asn | Arg | Arg | Glu | Leu | Asp | Ile | Leu | Phe | Leu | | |
| | | | | 515 | | | | | 520 | | | | | 525 | | |
| caa | gag | gga | ggg | ctc | tgt | gcc | gca | ttg | aaa | gaa | gaa | tgt | tgc | ttc | 1670 | |
| Gln | Glu | Gly | Gly | Leu | Cys | Ala | Ala | Leu | Lys | Glu | Glu | Cys | Cys | Phe | | |
| | | | | 530 | | | | | 535 | | | | | 540 | | |
| tat | gcg | gat | cac | acc | gga | ctc | gtc | cga | gac | aat | atg | gcc | aaa | tta | 1715 | |
| Tyr | Ala | Asp | His | Thr | Gly | Leu | Val | Arg | Asp | Asn | Met | Ala | Lys | Leu | | |
| | | | | 545 | | | | | 550 | | | | | 555 | | |
| aga | gaa | aga | cta | aaa | cag | cgg | caa | caa | ctg | ttt | gac | tcc | caa | cag | 1760 | |
| Arg | Glu | Arg | Leu | Lys | Gln | Arg | Gln | Gln | Leu | Phe | Asp | Ser | Gln | Gln | | |
| | | | | 560 | | | | | 565 | | | | | 570 | | |
| gga | tgg | ttt | gaa | gga | tgg | ttc | aac | aag | tcc | ccc | tgg | ttt | aca | acc | 1805 | |
| Gly | Trp | Phe | Glu | Gly | Trp | Phe | Asn | Lys | Ser | Pro | Trp | Phe | Thr | Thr | | |
| | | | | 575 | | | | | 580 | | | | | 585 | | |
| cta | att | tcc | tcc | att | atg | ggc | ccc | tta | cta | atc | cta | ctc | cta | att | 1850 | |
| Leu | Ile | Ser | Ser | Ile | Met | Gly | Pro | Leu | Leu | Ile | Leu | Leu | Leu | Ile | | |
| | | | | 590 | | | | | 595 | | | | | 600 | | |
| ctc | ctc | ttc | ggc | cca | tgc | atc | ctt | aac | cga | tta | gta | caa | ttc | gta | 1895 | |
| Leu | Leu | Phe | Gly | Pro | Cys | Ile | Leu | Asn | Arg | Leu | Val | Gln | Phe | Val | | |
| | | | | 605 | | | | | 610 | | | | | 615 | | |
| aaa | gac | aga | ata | tct | gtg | gta | cag | gct | tta | att | tta | acc | caa | cag | 1940 | |
| Lys | Asp | Arg | Ile | Ser | Val | Val | Gln | Ala | Leu | Ile | Leu | Thr | Gln | Gln | | |
| | | | | 620 | | | | | 625 | | | | | 630 | | |
| tac | caa | cag | ata | aag | caa | tac | gat | ccg | gac | cga | cca | tga | | | 1979 | |
| Tyr | Gln | Gln | Ile | Lys | Gln | Tyr | Asp | Pro | Asp | Arg | Pro | | | | | |
| | | | | 635 | | | | | 640 | | | | | | | |